

June 7, 2004

MEMORANDUM TO: Eric J. Leeds, Deputy Director  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation (NRR)

FROM: Cynthia D. Pederson, Director */RA/*  
Division of Reactor Safety

SUBJECT: REQUEST FOR TECHNICAL ASSISTANCE - DEGRADED  
VOLTAGE PROTECTION AT D. C. COOK (TIA 2004-02)

Region III requests NRR assistance to resolve the degraded voltage issue associated with the licensing basis and conformance with Technical Specifications 3.3.2.1. at the Donald C. Cook Nuclear Power Plant.

#### Background

On July 11, 2003, the NRC completed the safety system design and performance capability biennial baseline inspection at the D. C. Cook Nuclear Power Plant (Reference 1). During the inspection, the inspectors identified that the degraded voltage protection scheme was bypassed whenever the 4160V buses were not being supplied through the reserve auxiliary transformers (RATs). This resulted in a lack of automatic degraded voltage protection during normal operation, and for the first 30 seconds of an accident when engineered safety feature (ESF) loads were being sequenced onto the safety buses. This did not appear to be in accordance with Standard Review Plan (SRP), Chapter 8, Appendix 8A, "Branch Technical Position PSB #1" (Reference 2).

Degraded voltage issues have been a concern at the D. C. Cook Nuclear Power Plant for a number of years and have resulted in several Task Interface Agreement (TIA) responses (References 3 and 4) from the NRR to Region III. Other discussions regarding the acceptability of the licensee's degraded voltage protection have been held with the licensee during the extended shutdown at D. C. Cook from September 1997 - July 2000. However, these discussions do not appear to be sufficiently documented in order for Region III to verify if the licensee's design for degraded voltage protection had been previously accepted by the NRC.

In order for the trip function of the degraded voltage scheme to be active, the supply breaker to the 4160V bus from the RATs must be closed. During normal operation, the 4160V buses are supplied through the unit auxiliary transformers (UATs) so the supply breakers from the RATs are open and the trip function of the degraded voltage protection scheme is disabled. This condition also exists for the first 30 seconds of an accident when the majority of ESF loads are sequenced onto the safety buses. This was due to a designed 30-second time delay between

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\*See Previous Concurrence

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the time a turbine trip signal was initiated by the reactor protection system, and the time the 4160V buses would be transferred from the UATs to the RATs. The associated relays and transfer scheme relied upon to transfer the 4160V buses to the RATs is classified as non-safety related.

This electrical scheme is contrary to the design criteria for degraded voltage protection stated in an NRC letter to the licensee (a version of a letter sent to all licensees) dated June 3, 1977 (Reference 5), and later incorporated into Branch Technical Position PSB #1, which stated, "The voltage sensors shall automatically initiate the disconnection of offsite power sources whenever the voltage set point and time delay limits have been exceeded." Technical Specifications 3.3.2.1, Table 3.3.3, item 8.b (Reference 6), requires degraded voltage protection whenever the units are in Modes 1, 2, 3, and 4. Neither the Technical Specifications nor its bases provided for bypassing the protection scheme when the units are connected to the UATs.

The licensee position was that degraded voltage protection was only required when the unit was connected to the "offsite" source. The licensee interpreted the term "offsite" to include only the RAT source and not to include the UAT source.

The inspectors reviewed the available record of correspondence and other communications between the licensee and the NRC and noted considerable ambiguity regarding the acceptability of this design. The original design for degraded voltage protection proposed by the licensee in a July 22, 1977 letter (Reference 7), featured a design where the safety buses would not be protected while being supplied by the UATs. The proposed design used undervoltage relays on the high side of the 34.5kV/4.16kV RATs in order to monitor the offsite power supply directly. The NRC did not approve this proposal and required the degraded voltage relays to monitor the 4160V safety busses citing the June 3, 1977 NRC Letter, which required the design of the voltage monitors to comply with IEEE-279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations (Reference 8)." The NRC letter stated that the intent of the position was that the undervoltage protection system for ESF loads were a part of the Class 1E distribution system.

The current design has the voltage monitors on the 4160V safety buses, but they only provide a trip function when the buses are supplied by the RATs. The licensee has described the UAT connection as the "normal" power supply and the RAT connection as the "preferred offsite" power supply. In general, the licensee has been consistent in stating that degraded voltage protection is available only when the 4160V buses are connected through the RATs, and not when connected to the UATs. However, it appears that the significance of this distinction had not been noted by the NRC until it was stated explicitly in Technical Specifications change request AEP: NRC 1063, dated November 28, 1988 (Reference 9), as follows, "Please note that the function of the Degraded Voltage relays is to disconnect the plant from the grid for a sustained degraded voltage condition. These relays are armed only when the plant is fed from offsite power and not normally active during unit operation." This statement did not note that the degraded voltage function was also not active for the critical first 30 seconds following an accident signal.

The NRC took note of the licensee's 1988 statement in the cover letter to Amendment Nos. 137 and 124 to License Nos. DPR-58 and DPR-74, dated May 25, 1990 (Reference 10). The NRC stated that the design was not in conformance with Branch Technical Position PSB #1 and recommended that the degraded voltage relays "remain in force regardless of the power sources connected to the safety busses; i.e., whether powered by the unit auxiliary transformer or the off-site power system." The licensee did not submit any additional response.

The licensee stated in an internal memo from M. J. Finissi to G. P. Argent, dated April 22, 1993 (Reference 11), that, "It is agreed that there is non-compliance with Branch Technical Position PSB #1." The memo justified the non-compliance based on two reasons: (1) there was a potential for tripping the degraded voltage scheme during operation under light load conditions on the grid with reduced generator voltage; and (2) AEP was not committed to Branch Technical Position PSB #1. The inspectors questioned the technical adequacy of this evaluation because a postulated accident scenario could occur when generator voltage was low and automatic protection of ESF loads was bypassed. Additionally, the TIA dated June 10, 1994 (Reference 3), for D.C. Cook stated, "After the Millstone and ANO-1 events, the staff developed generic requirements for degraded grid protection. Under MPA B-23, all licensees were required to address degraded voltage conditions. These generic requirements were subsequently documented in Branch Technical Position BTP-1 in the SRP. Therefore, Office of Nuclear Reactor Regulation (NRR) considers the requirements for degraded voltage protection to be part of the plant's current licensing basis." Therefore, although specific commitments to PSB #1 may not have been made, it appeared that conformance to PSB #1 may have been assumed in previous NRC licensing actions.

There was no record that the NRC formally reviewed and accepted the existing degraded voltage protection scheme, particularly with respect to the bypassing of degraded voltage protection during the first 30 seconds of a postulated accident.

Although the inspectors concluded that bypassing the degraded voltage protection during normal operations when offsite power is supplied through the UATs is not in accordance with the 1977 Generic Letter and Branch Technical Position PSB #1, the licensee stated that they are not committed to the Branch Technical Position and this issue had been resolved during the extended shutdown of the D.C. Cook units. The licensee was unable to provide any documentation or details of this resolution during the inspection. In addition, this position, does not appear to conform to the 1994 TIA in which NRR implied that Branch Technical Position PSB #1 was part of the plant's current licensing basis. Based on this conflicting information, an unresolved item (URI 50-315, 316/2003007-02) was opened in the NRC inspection report pending further NRC review to determine the current licensing basis for the D.C. Cook facility with respect to degraded voltage protection and whether the licensee is in conformance with Technical Specifications 3.3.2.1.

Requested Action

Evaluate the lack of automatic degraded voltage protection during normal operation (when power is supplied through the UATs), and for the first 30 seconds following an accident signal when ESF loads are being sequenced onto the safety buses, to determine if the design meets D.C. Cook's current licensing basis, and if this is adequate.

Coordination

This request was discussed between Julio Lara (RIII/DRS/EEB), Cornelius Holden (NRR/DLPM/PD-1), John Lamb (NRR/DLPM/LPD3) and others during a conference call held on May 25, 2004. It was agreed that NRR would accept this issue as a Task Interface Agreement and respond to this request within 90 days after receipt.

Attachment: References

cc: F. Congel, OE  
EJL, NRR  
RIDSNNRDLPMLPDIII

## References

1. Donald C. Cook Nuclear Power Plant, Units 1 and 2 NRC Inspection Report No. 50-315/03-07(DRS); 50-316/03-07(DRS) (ADAMS Accession No. ML032260201)
2. Standard Review Plan, Chapter 8, Appendix 8A, Branch Technical Position PSB #1
3. D.C. Cook 1 and 2 - TIA on the Adequacy of the Electrical Distribution System (TAC Nos. M87053 and 87054) (TIA 93-0426); dated June 10, 1994
4. TIA 96-0170: Acceptability of the 5-Year Grid Study for the Degraded Voltage Evaluation for Operability Determinations at D.C. Cook (TAC Nos. M96486/M96487), dated December 10, 1996
5. Letter dated June 3, 1977 Letter From NRC (ADAMS Legacy Library Accession No. 4007001118)
6. Technical Specifications 3.3.2.1, Table 3.3.3, item 8.b
7. Letter 77053; Comparison of Emergency Power Systems with Staff Positions of June 3, 1977 Letter From NRC; dated July 22, 1977 (Attached)
8. IEEE-279-1971, Criteria for Protection Systems for Nuclear Power Generating Stations
9. AEP:NRC 1063; Revised Engineered Safety Feature 4 KV Bus Loss of Voltage and Degraded Voltage Trip Setpoints and Allowable Values-Tech Spec Change Request; dated November 29, 1988 (ADAMS Legacy Library Accession Nos. 8812050036 and 8812050037)
10. N90072; Amendment Nos. 137 and 124 to Facility Operating License Nos. DPR-58 and DPR-74: (TAC Nos. 71407 and 71410); dated May 25, 1990 (ADAMS Legacy Library Accession No. 9006130335)
11. Memo M.J. Finissi to G.P. Argent; Degraded-Grid Design Basis; dated April 22, 1993